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10/646,897

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Warren M. Farnworth

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01/25/2006

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EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 01/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/646,897	Applicant(s) FARNWORTH ET AL.	
	Examiner Monica Lewis	Art Unit 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 153-188 is/are pending in the application.
- 4a) Of the above claim(s) 153-169 and 180-188 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 170-179 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the amendment filed November 14, 2005.

Response to Arguments

2. Applicant's arguments with respect to claims 170-179 have been considered but are moot in view of the new ground(s) of rejection. (Note: Applicant has amended the claims to state that the thinned die had to be able to be encapsulated on all six sides. Therefore, a new reference had to be disclosed which provided the capability for a thinned die to be encapsulated on all six sides).

Specification

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: a) 36P-E (See Figure 1L). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not

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accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

5. Claims 170-179 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification states “one type of semiconductor component is referred to as a chip scale package (CSP) because it has an outline or "footprint", that **is about** the same as the outline of the die contained in the package” (See Page 2 Lines 12-16). However, the claim states that the component has an outline **equal** to that of the die (See Claim 170). There is a difference between “is about” and “equal.” Claims 171-179 depend directly or indirectly from a rejected claim and are, therefore, also rejected under 35 U.S.C. 112, first paragraph for the reasons set above.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 170-175 are rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Mountain (U.S. Patent No. 6,013,534) and Wakabayashi et al. (U.S. Patent No. 6,607,970).

In regards to claim 170, Kinsman et al. ("Kinsman") discloses the following:

a) a semiconductor die having an outline, circuit side, a back side, four peripheral edges, and a plurality of die contacts (12) on the circuit side (For Example: See Figure 2 and Column 4 Lines 53-55);

b) a plurality of contact bumps (20) on the die contacts (For Example: See Figure 2);

c) a first polymer layer (30) covering the circuit side and the contact bumps (For Example: See Figure 2, Column 5 Line 67 and Column 6 Lines 1 and 2);

d) a second layer (30) covering the back side (For Example: See Figure 2); and

e) a plurality of terminal contacts (32) on the contact bumps (For Example: See Figure 2).

In regards to claim 170, Kinsman fails to disclose the following:

a) a thinned die.

However, Mountain discloses a semiconductor device that has a thinned die (For Example: See Figure 17). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a thinned die as disclosed in Mountain because it aids in reducing the package size (For Example: See Column 1 Lines 33-36).

Additionally, since Kinsman and Mountain are both from the same field of endeavor, the purpose disclosed by Mountain would have been recognized in the pertinent art of Kinsman.

b) the first polymer layer and the second polymer layer encapsulating the die on six sides such that the component has an outline equal to that of the die plus the selected thickness of the first polymer layer on each peripheral edge.

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However, Wakabayashi discloses a semiconductor device where the first polymer layer (13) and the second polymer layer (17) encapsulate the die on six sides such that the component has an outline equal to that of the die plus the selected thickness of the first polymer layer covers the four peripheral edges (For Example: See Figure 15, Column 3 Line 67 and Column 4 Line 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a polymer layer that covers the edges as disclosed in Wakabayashi because it aids in preventing water or moisture from entering (For Example: See Column 4 Lines 35-43).

Additionally, since Kinsman and Wakabayashi are both from the same field of endeavor, the purpose disclosed by Wakabayashi would have been recognized in the pertinent art of Kinsman.

In regards to claim 171, Kinsman fails to disclose the following:

- a) the selected thickness is about 1 mil.

However, the applicant has not established the critical nature of the selected thickness is about 1 mil. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges.

In regards to claim 172, Kinsman discloses the following:

- a) the contact bumps comprise metal bumps (For Example: See Column 4 Lines 62-64).

In regards to claim 173, Kinsman discloses the following:

a) the terminal contacts comprise conductive bumps or balls (For Example: See Column 8 Line 23).

In regards to claim 174, Kinsman discloses the following:

a) the first polymer layer has a planar first surface (For Example: See Column 6 Lines 20-22).

In regards to claim 175, Kinsman disclose the following:

a) the second polymer layer has a planar second surface (For Example: See Column 6 Lines 20-22).

8. Claim 176 and 177 are rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Mountain (U.S. Patent No. 6,013,534), Wakabayashi et al. (U.S. Patent No. 6,607,970) and Farnworth et al. (U.S. Patent No. 6,620,731).

In regards to claim 176, Kinsman fails to disclose the following:

a) a plurality of conductive vias in the die electrical communication with the die contacts and with the terminal contacts.

However, Farnworth et al. ("Farnworth") discloses a semiconductor device that utilizes a plurality of conductive vias (30) in the die electrical communication with contacts (38) (For Example: See Figures 1A-1G and Column 4 Lines 1-4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a plurality of conductive vias as disclosed in Farnworth because it aids in providing electrical communication between the integrated circuit and the contacts (For Example: See Abstract).

Additionally, since Kinsman and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Kinsman.

b) a thinned die.

However, Mountain discloses a semiconductor device that has a thinned die (For Example: See Figure 17). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a thinned die as disclosed in Mountain because it aids in reducing the package size (For Example: See Column 1 Lines 33-36).

Additionally, since Kinsman and Mountain are both from the same field of endeavor, the purpose disclosed by Mountain would have been recognized in the pertinent art of Kinsman.

In regards to claim 177, Kinsman fails to disclose the following:

a) a plurality of second die contacts on the second polymer layer in electrical communication with conductive vias.

However, Farnworth discloses a semiconductor device that has a plurality of second die contacts (40) on the second polymer layer (22) in electrical communication with conductive vias (30) (For Example: See Figures 1A-1G). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a plurality of contacts on the polymer layer as disclosed in Farnworth because it aids in providing electrical communication between the integrated circuit and the contacts (For Example: See Abstract).

Additionally, since Kinsman and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Kinsman.

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9. Claim 178 is rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Mountain (U.S. Patent No. 6,013,534), Wakabayashi et al. (U.S. Patent No. 6,607,970) and Akram (U.S. Patent No. 6,544,821).

In regards to claim 178, Kinsman fails to disclose the following:

a) the second polymer layer comprises a photopolymer.

However, Akram discloses a semiconductor device that utilizes a photopolymer (For Example: See Column 7 Line 31). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a photopolymer layer as disclosed in Akram because it aids in protecting the device (For Example: See Column 7 Lines 31 and 32).

Additionally, since Kinsman and Akram are both from the same field of endeavor, the purpose disclosed by Akram would have been recognized in the pertinent art of Kinsman.

10. Claim 179 is rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Mountain (U.S. Patent No. 6,013,534), Wakabayashi et al. (U.S. Patent No. 6,607,970) and Gilleo et al. (U.S. Patent No. 6,228,678).

In regards to claim 179, Kinsman fails to disclose the following:

a) the second polymer layer comprises a wafer level underfill.

However, Gilleo et al. ("Gilleo") discloses a semiconductor device that has polymer that comprises an underfill material (For Example: See Column 4 Lines 17 and 18). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a polymer layer that comprises an underfill as

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disclosed in Gilleo because it aids in minimizing thermal fatigue (For Example: See Column 1 Lines 60-66).

Additionally, since Kinsman and Gilleo are both from the same field of endeavor, the purpose disclosed by Gilleo would have been recognized in the pertinent art of Kinsman.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300 for regular and after final

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communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML

January 11, 2006

A handwritten signature in black ink, appearing to be 'Mary Wilczewski', written over a horizontal dotted line.

Mary Wilczewski
Primary Examiner